ABSTRACT OF THE DISCLOSURE

An object of the present invention is to improve the inter-layer adhesiveness of the diffusion barrier film while maintaining the lower dielectric constant of the diffusion barrier film. A diffusion barrier film for a copper interconnect comprises an insulating material containing silicon, carbon, hydrogen and nitrogen as constituent elements, and also containing Si-H bond, Si-C bond and methylene bond ($-CH_2-$). The insulating material involves I_2/I_1 of not lower than 0.067 and I_3/I_1 of not higher than 0.0067 appeared in an infrared absorption spectrum; where I_1 is defined as an absorption area of the infrared absorption band having a peak near 810 cm^{-1}, I_2 is defined as an absorption area of the infrared absorption band having a peak near 2,120 cm^{-1} and I_3 is defined as an absorption area of the infrared absorption band having a peak near 1,250 cm^{-1}.